

AMENDMENTS TO THE CLAIMS

1. (Original) A method for determining grid dimensions, comprising:
providing a wafer having a test structure comprising a plurality of intersecting lines that
define a grid having openings;
illuminating at least a portion of the grid with a light source;
measuring light reflected from the illuminated portion of the grid to generate a reflection
profile; and
determining a dimension of the grid based on the reflection profile.

2. (Currently Amended) ~~The method of claim 1,~~ A method for determining grid
dimensions, comprising:

providing a wafer having a test structure comprising a plurality of intersecting lines that
define a grid having openings;
illuminating at least a portion of the grid with a light source;
measuring light reflected from the illuminated portion of the grid to generate a reflection
profile; and
determining a dimension of the grid based on the reflection profile, wherein determining
the dimension of the grid further comprises:

comparing the generated reflection profile to a library of reference reflection profiles,
each reference reflection profile having an associated grid dimension metric;
selecting a reference reflection profile closest to the generated reflection profile; and
determining the dimension of the grid based on the grid dimension metric associated with
the selected reference reflection profile.

3. (Original) The method of claim 1, further comprising determining at least one parameter of an operating recipe of a etch tool adapted to etch a subsequent wafer based on the determined grid dimension.

4. (Currently Amended) ~~The method of claim 3,~~ A method for determining grid dimensions, comprising:

providing a wafer having a test structure comprising a plurality of intersecting lines that

define a grid having openings;

illuminating at least a portion of the grid with a light source;

measuring light reflected from the illuminated portion of the grid to generate a reflection

profile; and

determining a dimension of the grid based on the reflection profile; and

determining at least one parameter of an operating recipe of a etch tool adapted to etch a subsequent wafer based on the determined grid dimension, wherein determining at least one parameter of the operating recipe of the etch tool comprises determining at least one of an etch time parameter, a plasma chemical composition parameter, an RF power parameter, a gas flow parameter, a chamber temperature parameter, a chamber pressure parameter, and an end-point signal parameter.

5. (Original) The method of claim 1, further comprising determining at least one parameter of an operating recipe of a photolithography tool adapted to process a subsequent wafer based on the determined grid dimension.

6. (Currently Amended) ~~The method of claim 5,~~ A method for determining grid dimensions, comprising:
providing a wafer having a test structure comprising a plurality of intersecting lines that
define a grid having openings;
illuminating at least a portion of the grid with a light source;
measuring light reflected from the illuminated portion of the grid to generate a reflection
profile; and
determining a dimension of the grid based on the reflection profile; and
determining at least one parameter of an operating recipe of a photolithography tool
adapted to process a subsequent wafer based on the determined grid dimension, wherein
determining at least one parameter of the operating recipe of the photolithography tool comprises
determining at least one of an exposure time parameter, an exposure dose parameter, a depth of
focus parameter, a resist spin speed parameter, a soft bake temperature parameter, a post
exposure bake temperature parameter, a cool plate temperature parameter, a developer
temperature parameter, and a focus tilt parameter.

7. (Original) The method of claim 1, wherein generating the reflection profile
comprises generating the reflection profile based on at least one of intensity and phase of the
reflected light.

8. (Original) The method of claim 1, wherein determining the dimension of the grid
further comprises:

comparing the generated reflection profile to a target reflection profile; and
determining the dimension of the grid based on the comparison of the generated
reflection profile and the target reflection profile.

9. (Original) The method of claim 1, further comprising identifying a fault condition
associated with the grid based on the determined grid dimension.

10. (Original) The method of claim 1, wherein determining the dimension of the grid
further comprises determining at least one of a width dimension, a depth dimension, and a
sidewall angle dimension.

11. (Original) A method for determining grid dimensions, comprising:
providing a wafer having a test structure comprising a plurality of intersecting lines that
define a grid having openings;
illuminating at least a portion of the grid with a light source;
measuring light reflected from the illuminated portion of the grid to generate a reflection
profile;
comparing the generated reflection profile to a library of reference reflection profiles,
each reference reflection profile having an associated grid dimension metric;
selecting a reference reflection profile closest to the generated reflection profile; and
determining a dimension of the grid based on the grid dimension metric associated with
the selected reference reflection profile.

12. (Original) The method of claim 11, further comprising determining at least one parameter of an operating recipe of a etch tool adapted to etch a subsequent wafer based on the determined grid dimension.

13. (Currently Amended) ~~The method of claim 12,~~ A method for determining grid dimensions, comprising:

providing a wafer having a test structure comprising a plurality of intersecting lines that define a grid having openings;

illuminating at least a portion of the grid with a light source;

measuring light reflected from the illuminated portion of the grid to generate a reflection profile;

comparing the generated reflection profile to a library of reference reflection profiles, each reference reflection profile having an associated grid dimension metric;

selecting a reference reflection profile closest to the generated reflection profile;

determining a dimension of the grid based on the grid dimension metric associated with the selected reference reflection profile; and

determining at least one parameter of an operating recipe of a etch tool adapted to etch a subsequent wafer based on the determined grid dimension, wherein determining at least one parameter of the operating recipe of the etch tool comprises determining at least one of an etch time parameter, a plasma chemical composition parameter, an RF power parameter, a gas flow parameter, a chamber temperature parameter, a chamber pressure parameter, and an end-point signal parameter.

14. (Original) The method of claim 11, further comprising determining at least one parameter of an operating recipe of a photolithography tool adapted to process a subsequent wafer based on the determined grid dimension.

15. (Currently Amended) ~~The method of claim 14,~~ A method for determining grid dimensions, comprising:

providing a wafer having a test structure comprising a plurality of intersecting lines that
define a grid having openings;
illuminating at least a portion of the grid with a light source;
measuring light reflected from the illuminated portion of the grid to generate a reflection
profile;
comparing the generated reflection profile to a library of reference reflection profiles,
each reference reflection profile having an associated grid dimension metric;
selecting a reference reflection profile closest to the generated reflection profile;
determining a dimension of the grid based on the grid dimension metric associated with
the selected reference reflection profile; and
determining at least one parameter of an operating recipe of a photolithography tool
adapted to process a subsequent wafer based on the determined grid dimension, wherein
determining at least one parameter of the operating recipe of the photolithography tool comprises
determining at least one of an exposure time parameter, an exposure dose parameter, a depth of
focus parameter, a resist spin speed parameter, a soft bake temperature parameter, a post
exposure bake temperature parameter, a cool plate temperature parameter, a developer
temperature parameter, and a focus tilt parameter.

16. (Original) The method of claim 11, wherein generating the reflection profile comprises generating the reflection profile based on at least one of intensity and phase of the reflected light.

17. (Original) The method of claim 11, further comprising identifying a fault condition associated with the grid based on the determined grid dimension.

18. (Original) The method of claim 11, wherein determining the dimension of the grid further comprises determining at least one of a width dimension, a depth dimension, and a sidewall angle dimension.

19. (Original) A method for determining grid dimensions, comprising:
providing a wafer having a test structure comprising a plurality of intersecting lines that
define a grid having openings;
illuminating at least a portion of the grid with a light source;
measuring light reflected from the illuminated portion of the grid to generate a reflection
profile; and
comparing the generated reflection profile to a target reflection profile; and
determining a dimension of the grid based on the comparison of the generated reflection
profile and the target reflection profile.

20. (Original) The method of claim 19, further comprising determining at least one parameter of an operating recipe of a etch tool adapted to etch a subsequent wafer based on the determined grid dimension.

21. (Currently Amended) ~~The method of claim 20,~~ A method for determining grid dimensions, comprising:

providing a wafer having a test structure comprising a plurality of intersecting lines that define a grid having openings;

illuminating at least a portion of the grid with a light source;

measuring light reflected from the illuminated portion of the grid to generate a reflection profile; and

comparing the generated reflection profile to a target reflection profile;

determining a dimension of the grid based on the comparison of the generated reflection profile and the target reflection profile; and

determining at least one parameter of an operating recipe of a etch tool adapted to etch a subsequent wafer based on the determined grid dimension, wherein determining at least one parameter of the operating recipe of the etch tool comprises determining at least one of an etch time parameter, a plasma chemical composition parameter, an RF power parameter, a gas flow parameter, a chamber temperature parameter, a chamber pressure parameter, and an end-point signal parameter.

22. (Original) The method of claim 19, further comprising determining at least one parameter of an operating recipe of a photolithography tool adapted to process a subsequent wafer based on the determined grid dimension.

23. (Currently Amended) ~~The method of claim 22,~~ A method for determining grid dimensions, comprising:

providing a wafer having a test structure comprising a plurality of intersecting lines that define a grid having openings;

illuminating at least a portion of the grid with a light source;

measuring light reflected from the illuminated portion of the grid to generate a reflection profile; and

comparing the generated reflection profile to a target reflection profile; and

determining a dimension of the grid based on the comparison of the generated reflection profile and the target reflection profile; and

determining at least one parameter of an operating recipe of a photolithography tool adapted to process a subsequent wafer based on the determined grid dimension, wherein determining at least one parameter of the operating recipe of the photolithography tool comprises determining at least one of an exposure time parameter, an exposure dose parameter, a depth of focus parameter, a resist spin speed parameter, a soft bake temperature parameter, a post exposure bake temperature parameter, a cool plate temperature parameter, a developer temperature parameter, and a focus tilt parameter.

24. (Original) The method of claim 19, wherein generating the reflection profile comprises generating the reflection profile based on at least one of intensity and phase of the reflected light.

25. (Original) The method of claim 19, further comprising identifying a fault condition associated with the grid based on the determined grid dimension.

26. (Original) The method of claim 19, wherein determining the dimension of the grid further comprises determining at least one of a width dimension, a depth dimension, and a sidewall angle dimension.

27. (Original) A metrology tool adapted to receive a wafer having a test structure comprising a plurality of intersecting lines that define a grid having openings, comprising:

a light source adapted to illuminate at least a portion of the grid;

a detector adapted to measure light reflected from the illuminated portion of the grid to generate a reflection profile; and

a data processing unit adapted to determine a dimension of the grid based on the reflection profile.

28. (Original) The metrology tool of claim 27, wherein the data processing unit is further adapted to compare the generated reflection profile to a library of reference reflection profiles, each reference reflection profile having an associated grid dimension metric, select a reference reflection profile closest to the generated reflection profile, and determine the

dimension of the grid based on the grid dimension metric associated with the selected reference reflection profile.

29. (Original) The metrology tool of claim 27, wherein the detector is further adapted to generate the reflection profile based on at least one of intensity and phase of the reflected light.

30. (Original) The metrology tool of claim 27, wherein the metrology tool comprises at least one of a scatterometer, an ellipsometer, and a reflectometer.

31. (Original) The metrology tool of claim 27, wherein the data processing unit is further adapted to compare the generated reflection profile to a target reflection profile and determine the dimension of the grid based on the comparison of the generated reflection profile and the target reflection profile.

32. (Original) A processing line, comprising:

a processing tool adapted to process wafers in accordance with an operating recipe;

a metrology tool adapted to receive a wafer having a test structure comprising a plurality of intersecting lines that define a grid having openings, the metrology tool comprising:

a light source adapted to illuminate at least a portion of the grid;

a detector adapted to measure light reflected from the illuminated portion of the grid to generate a reflection profile; and

a data processing unit adapted to determine a dimension of the grid based on the reflection profile; and
a controller adapted to determine at least one parameter of the operating recipe of the processing tool based on the determined grid dimension.

33. (Original) The processing line of claim 32, wherein the data processing unit is further adapted to compare the generated reflection profile to a library of reference reflection profiles, each reference reflection profile having an associated grid dimension metric, select a reference reflection profile closest to the generated reflection profile, and determine the dimension of the grid based on the grid dimension metric associated with the selected reference reflection profile.

34. (Original) The processing line of claim 32, wherein the detector is further adapted to generate the reflection profile based on at least one of intensity and phase of the reflected light.

35. (Original) The processing line of claim 32, wherein the metrology tool comprises at least one of a scatterometer, an ellipsometer, and a reflectometer.

36. (Original) The processing line of claim 32, wherein the data processing unit is further adapted to compare the generated reflection profile to a target reflection profile and determine the dimension of the grid based on the comparison of the generated reflection profile and the target reflection profile.

37. (Currently Amended) ~~The processing line of claim 32,~~ A processing line,
comprising:

a processing tool adapted to process wafers in accordance with an operating recipe;

a metrology tool adapted to receive a wafer having a test structure comprising a plurality
of intersecting lines that define a grid having openings, the metrology tool
comprising:

a light source adapted to illuminate at least a portion of the grid;

a detector adapted to measure light reflected from the illuminated portion
of the grid to generate a reflection profile; and

a data processing unit adapted to determine a dimension of the grid based
on the reflection profile; and

a controller adapted to determine at least one parameter of the operating recipe of the
processing tool based on the determined grid dimension, wherein the processing tool further
comprises an etch tool, and the controller is further adapted to determine at least one of an etch
time parameter, a plasma chemical composition parameter, an RF power parameter, a gas flow
parameter, a chamber temperature parameter, a chamber pressure parameter, and an end-point
signal parameter.

38. (Currently Amended) ~~The processing line of claim 32,~~ A processing line,
comprising:

a processing tool adapted to process wafers in accordance with an operating recipe;

a metrology tool adapted to receive a wafer having a test structure comprising a plurality of intersecting lines that define a grid having openings, the metrology tool comprising:

a light source adapted to illuminate at least a portion of the grid;

a detector adapted to measure light reflected from the illuminated portion of the grid to generate a reflection profile; and

a data processing unit adapted to determine a dimension of the grid based on the reflection profile; and

a controller adapted to determine at least one parameter of the operating recipe of the processing tool based on the determined grid dimension, wherein the processing tool further comprises a photolithography tool, and the controller is further adapted to determine at least one of an exposure time parameter, an exposure dose parameter, a depth of focus parameter, a resist spin speed parameter, a soft bake temperature parameter, a post exposure bake temperature parameter, a cool plate temperature parameter, a developer temperature parameter, and a focus tilt parameter.

39. (Original) The processing line of claim 32, wherein the controller is further adapted to identify a fault condition associated with the grid based on the determined grid dimension.

40. (Original) A metrology tool adapted to receive a wafer having a test structure comprising a plurality of intersecting lines that define a grid having openings, comprising:

a light source adapted to illuminate at least a portion of the grid;

a detector adapted to measure light reflected from the illuminated portion of the grid to generate a reflection profile; and

a data processing unit adapted to compare the generated reflection profile to a library of reference reflection profiles, each reference reflection profile having an associated grid dimension metric, select a reference reflection profile closest to the generated reflection profile, and determine a dimension of the grid based on the grid dimension metric associated with the selected reference reflection profile.

41. (Original) A metrology tool adapted to receive a wafer having a test structure comprising a plurality of intersecting lines that define a grid having openings; a plurality of trenches, comprising:

a light source adapted to illuminate at least a portion of the grid;

a detector adapted to measure light reflected from the illuminated portion of the grid to generate a reflection profile; and

a data processing unit adapted to compare the generated reflection profile to a target reflection profile and determine a dimension of the grid based on the comparison of the generated reflection profile and the target reflection profile.

42. (Original) A test structure, comprising:

a first plurality of lines; and

a second plurality of lines intersecting the first plurality of lines, the first and second pluralities of lines defining a grid having openings.

43. (Original) The test structure of claim 42, further comprising a process layer, the grid being defined in the process layer.

44. (Original) The test structure of claim 42, wherein the process layer comprises at least one of a photoresist layer, a substrate layer, an insulative layer, and a conductive layer.

45. (Original) A metrology tool, comprising:

means for receiving a wafer having a test structure comprising a plurality of intersecting lines that define a grid having openings;

means for illuminating at least a portion of the grid with a light source;

means for measuring light reflected from the illuminated portion of the grid to generate a reflection profile; and

means for determining a dimension of the grid based on the reflection profile.

46. (Original) The metrology tool of claim 45, further comprising:

means for comparing the generated reflection profile to a library of reference reflection profiles, each reference reflection profile having an associated grid dimension metric;

means for selecting a reference reflection profile closest to the generated reflection profile; and

means for determining the dimension of the grid based on the grid dimension metric associated with the selected reference reflection profile.

47. (Original) The metrology tool of claim 45, further comprising:
means for comparing the generated reflection profile to a target reflection profile; and
means for determining the dimension of the grid based on the comparison of the
generated reflection profile and the target reflection profile.